

# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>ASW1526</b>	<b>FOR FURTHER ACTION</b>		see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. <b>PCT/GB2004/001731</b>	International filing date (day/month/year) <b>23/04/2004</b>	(Earliest) Priority Date (day/month/year) <b>25/04/2003</b>	
Applicant  <b>CRX LIMITED</b>			

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ The international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
- b. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box II).

3. ☐ **Unity of invention is lacking** (see Box III).

4. With regard to the **title**,

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

- a. the figure of the **drawings** to be published with the abstract is Figure No. 1
- ☒ as suggested by the applicant.
- ☐ as selected by this Authority, because the applicant failed to suggest a figure.
- ☐ as selected by this Authority, because this figure better characterizes the invention.
- b. ☐ none of the figures is to be published with the abstract.

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/GB2004/001731

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 H01J35/04 H01J35/08

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 H01J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)  
EPO-Internal, WPI Data, PAJ, INSPEC

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 23, 10 February 2001 (2001-02-10) & JP 2001 176408 A (NEW JAPAN RADIO CO LTD), 29 June 2001 (2001-06-29) abstract; figures 2-4	1-11
Y	EP 0 432 568 A (GENERAL ELECTRIC COMPANY) 19 June 1991 (1991-06-19) page 3, column 3, line 22 - line 37	1-11
Y	PATENT ABSTRACTS OF JAPAN vol. 016, no. 294 (E-1225), 29 June 1992 (1992-06-29) & JP 04 079128 A (NEC CORP), 12 March 1992 (1992-03-12) abstract; figure 1	5

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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*Z\* document member of the same patent family

Date of the actual completion of the international search

18 May 2005

Date of mailing of the international search report

27/05/2005

Name and mailing address of the ISA

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No  
PCT/GB2004/001731

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
JP 2001176408	A	29-06-2001	NONE	
EP 0432568	A	19-06-1991	EP 0432568 A2 JP 4144045 A	19-06-1991 18-05-1992
JP 04079128	A	12-03-1992	NONE	
US 4887604	A	19-12-1989	NONE	
US 3239706	A	08-03-1966	NONE	
EP 0584871	A	02-03-1994	DE 4228559 A1 DE 59304524 D1 EP 0584871 A1 JP 6162972 A	03-03-1994 02-01-1997 02-03-1994 10-06-1994
SU 1022236	A1	07-06-1983	NONE	
EP 0924742	A	23-06-1999	US 6005918 A DE 69814574 D1 DE 69814574 T2 EP 0924742 A2 JP 11273597 A	21-12-1999 18-06-2003 18-03-2004 23-06-1999 08-10-1999

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

## PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY  
(PCT Rule 43bis.1)

Date of mailing  
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference  
see form PCT/ISA/220

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
PCT/GB2004/001731

International filing date (day/month/year)  
23.04.2004

Priority date (day/month/year)  
25.04.2003

International Patent Classification (IPC) or both national classification and IPC  
H01J35/04, H01J35/08

Applicant  
CRX LIMITED

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☒ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

### 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Initial from  
Search report

27 08 05



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**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/GB2004/001731

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**Box No. I Basis of the opinion**

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1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
  - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:
    - ☐ a sequence listing
    - ☐ table(s) related to the sequence listing
  - b. format of material:
    - ☐ in written format
    - ☐ in computer readable form
  - c. time of filing/furnishing:
    - ☐ contained in the international application as filed.
    - ☐ filed together with the international application in computer readable form.
    - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/GB2004/001731

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**Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

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The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application,
- ☒ claims Nos. 12

because:

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):
- ☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 12 are so unclear that no meaningful opinion could be formed (*specify*):

**see separate sheet**

- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
- ☐ no international search report has been established for the whole application or for said claims Nos.
- ☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:

the written form

- ☐ has not been furnished
- ☐ does not comply with the standard

the computer readable form

- ☐ has not been furnished
- ☐ does not comply with the standard

- ☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions.
- ☐ See separate sheet for further details

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/GB2004/001731

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**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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**1. Statement**

Novelty (N)	Yes: Claims	1-11
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	1-11
Industrial applicability (IA)	Yes: Claims	1-11
	No: Claims	

**2. Citations and explanations**

**see separate sheet**

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**Box No. VII Certain defects in the international application**

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The following defects in the form or contents of the international application have been noted:

**see separate sheet**

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**Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**Re Item III**

**Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

**Claim 12** contains **references to the description** and the drawings. According to Rule 6.2(a) PCT, claims should not contain such references except where absolutely necessary, which is not the case here.

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

Reference is made to the following documents:

- D1: PATENT ABSTRACTS OF JAPAN vol. 2000, no. 23, 10 February 2001 (2001-02-10) & JP 2001 176408 A (NEW JAPAN RADIO CO LTD), 29 June 2001
- D2: EP-A-0 432 568 (GENERAL ELECTRIC COMPANY) 19 June 1991
- D3: PATENT ABSTRACTS OF JAPAN vol. 016, no. 294 (E-1225), 29 June 1992 (1992-06-29) & JP 04 079128 A (NEC CORP), 12 March 1992
- D4: US-A-4 887 604 (SHEFER ET AL) 19 December 1989

An English computer translation of D1 can be obtained from the Internet homepage of the Japanese Patent Office (hyperlink "Patent & Utility Model Gazette DB" under option "Patent & Utility Model" on [http://www.ipdl.ncipi.go.jp/homepg\\_e.ipdl](http://www.ipdl.ncipi.go.jp/homepg_e.ipdl)).

- V.1 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of **claim 1 does not involve an inventive step** in the sense of Article 33(3) PCT.
- V.2 The document **D1** is regarded as being the **closest prior art** to the subject-matter of claim 1, and discloses (the references in parentheses applying to this document):
- V.3 An X-ray tube (abstract, figures 2, 4)  
comprising, a cathode arranged to provide a source of electrons (4 in figure 2),



an anode (2 in figure 2)  
held at a positive potential with respect to the cathode ( $V_a$ )  
and arranged to accelerate electrons from the cathode such that they will impact on  
the anode thereby to produce X-rays (implicitly, "X" in figure 2),  
wherein the anode is a thin film anode (abstract)  
and a retardation electrode (3 in figure 2)  
held at a negative potential with respect to the anode (figure 2; D1, paragraphs  
[0018], [0020],  $V_a=100\text{kV}$ ;  $V_c=10\text{kV}$ )  
thereby to produce an electric field between the anode and the retardation electrode  
which slows down electrons which have passed through the anode thereby reducing  
the amount of heat they can generate in the tube (D1, figure 2, abstract; implicitly  
from the voltages),  
wherein the retardation electrode is located on the opposite side of the anode to the  
cathode (figure 2).

- V.4 The subject-matter of present claim 1 therefore differs from this known X-ray tube in  
that the x-ray tube of present claim 1 is a transmission target tube whereas D1  
discloses a normal mode x-ray tube (figure 2).
- V.5 To achieve the same advantages as described in D1, namely the improved energy  
efficiency (D1, abstract) and thus reduced heat generation, in the whole technical  
area of x-ray tubes, it is obvious to a person skilled in the art to transfer the teaching  
of D1 to also to also in other types of y-ray tubes like the well-known transmission  
target tubes (cf. e.g. in D2).  
To use X-ray radiation that is transmitted through the thin film anode disclosed in D1  
he would - without the exercise of inventive skill - adapt the collector 3 of D1  
accordingly to be transparent to the desired x-ray energies (e.g. by using a design  
similar to that of an x-ray transparent window as disclosed in D2, column 2, ll. 29-31  
which is already used to collect electrons, D2, column 3, ll. 34-37), leading him to  
subject matter that falls under claim 1.
- V.8 Dependent **claims 2-11** do not contain any features which, in combination with the  
features of any claim to which they refer, meet the requirements of the PCT in  
respect of **inventive step**, see documents D1/D2 and the corresponding passages

cited in the search report, in particular:

claim 2:

positive potential of retardation electrode with respect to cathode: D1, figure 2

claim 3:

retardation electrode made of electrically conducting material: D1, implicitly

claim 4:

retardation electrode part of electrical circuit, collected electrons conducted away: D1, figure 2

claim 5:

resistor: connecting collector electrodes to the corresponding terminals via resistors is a well known method for adapting the collector voltage, cf. e.g. D3, figure 1 and abstract

claims 6, 7, 10:

retardation electrode between housing and anode or part of the housing, retardation electrode between anode and window: the particular shape and position of the retardation electrode is a mere design feature and will be readily chosen by a skilled person when adapting the x-ray tube e.g. to a desired photon energy range.

claims 8, 9:

target supported by backing layer of lower atomic number, thickness of 5 microns or less: D1, figure 3, paragraph [0018]

claim 11:

filter: the use of filters and in particular line filters is well known in the art, cf. e.g. D4, figures 4 and 5; column 5, l. 60 - column 6, l. 2

**Re Item VII**

VII.1 Independent claim 1 is not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art being placed in the preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).

VII.2 The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

### **Re Item VIII**

The embodiments 2-4 of the invention (p. 6, l. 11 - p. 7, l. 25; figures 2-4) do not fall within the scope of the claims: The claims define a **transmission target x-ray tube**. However, embodiments 2-4 refer **non-transmission (i.e. reflection) target x-ray tubes** and it is stated on p. 1, l. 26 that "the present invention provides an x-ray tube" in general.

This inconsistency between the claims and the description leads to doubt concerning the matter for which protection is sought, thereby rendering the claims unclear, Article 6 PCT (cf. Guidelines 5.29).

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB2004/001731

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

C. Entry	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4 887 604 A (SHEFER ET AL) 19 December 1989 (1989-12-19) column 7, line 3 - line 23; figures 4,5 -----	11
A	US 3 239 706 A (FARRELL SHERMAN R ET AL) 8 March 1966 (1966-03-08) column 1 - column 3; figure 1 -----	1-11
A	EP 0 584 871 A (TAN, DAGANG, DR) 2 March 1994 (1994-03-02) page 4, line 18 - line 41; figure 2 page 2, line 1 - line 12 -----	
A	SU 1 022 236 A1 (INST SILNOTOCHNOJ ELEKTRONIKI SO AN SSSR) 7 June 1983 (1983-06-07) figures 1,2 -----	
A	EP 0 924 742 A (PICKER INTERNATIONAL, INC; MARCONI MEDICAL SYSTEMS, INC) 23 June 1999 (1999-06-23) column 4, line 25 - line 33 column 6, paragraph 0020; figure 2 -----	